



PSPG Renewables, November 2011

Solar Power Plants from ABB

Reliable Turn Key Plants

ABB offers Turn Key Solar Power Plants

Reliable Execution and Guaranteed Performance

CSP Power Plants

- Cost effective direct Steam Generation
- Novatec Linear Fresnel Technology
- Highly efficient with 500°C Steam
- Highest yield per m² Land and CAPEX
- Scalable without Limitations



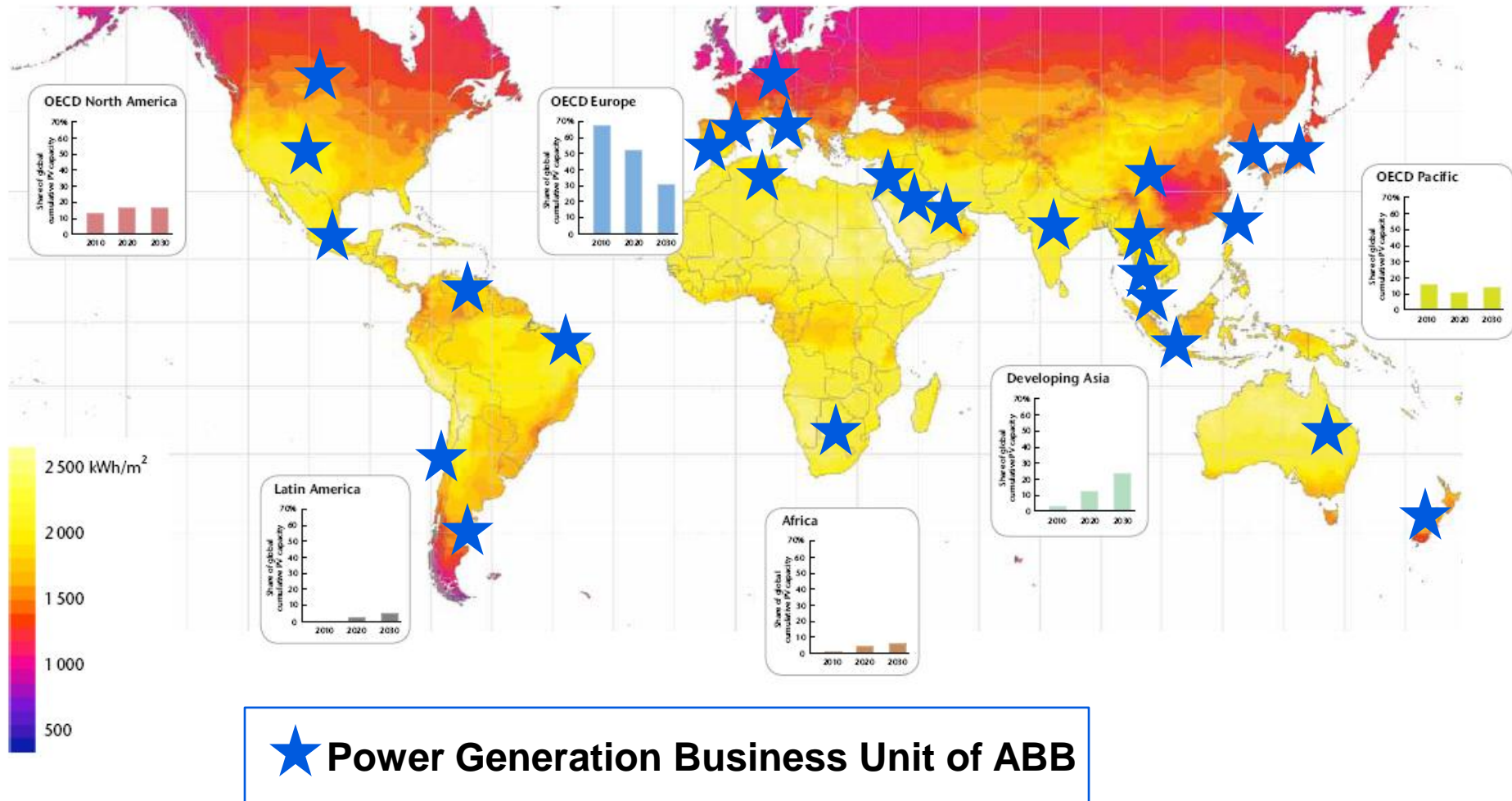
PV Power Plants

- Optimized integrated Solution
- Maximal Yield at each Moment of Day
- Fast Execution with Modularized System
- Integration into Grid
- Adequate for each kind of PV module



The Sunbelt of the World

ABB is well positioned for all relevant Solar Markets

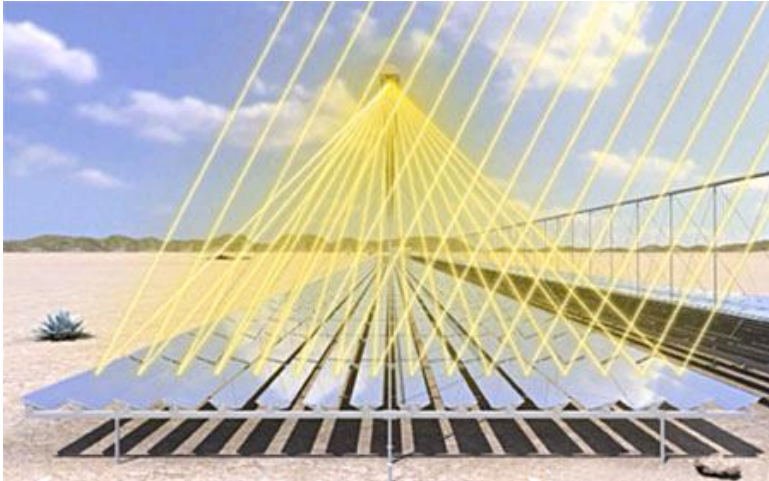




Concentrated Solar Power

In cooperation with Novatec Solar

Concentrated Solar Power Technical Concept



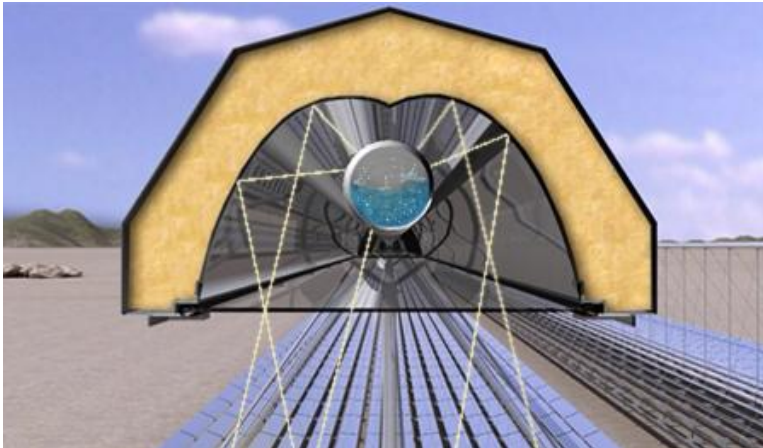
The solar radiation is harvested and concentrated by a Fresnel reflector.

Eight rows of mirrors are continuously tracked to focus the radiation to the receiver.

Water is pumped through the receiver tube, generating steam at 100 bar with temperatures of up to 500°C.

The Steam runs a Turbine to generate Electricity or is used for other processes.

ABB cooperates exclusively with NOVATEC Solar who has developed the most efficient CSP technology.



Concentrated Solar Power Application

CSP Power Plants

- New Solar Thermal Power Plants
 - From 50 to 250 MWe
 - Efficient with 500°C / 100 bar
- Integrated Solar Combined Cycle
 - Solar only at day, CC at night
 - Fossil Fuel saver



CSP Process Steam

- Desalination of Seawater
- Solar Cooling
 - District Cooling Networks
 - LNG production
- Enhanced Oil Recovery
- Process Steam for Industry

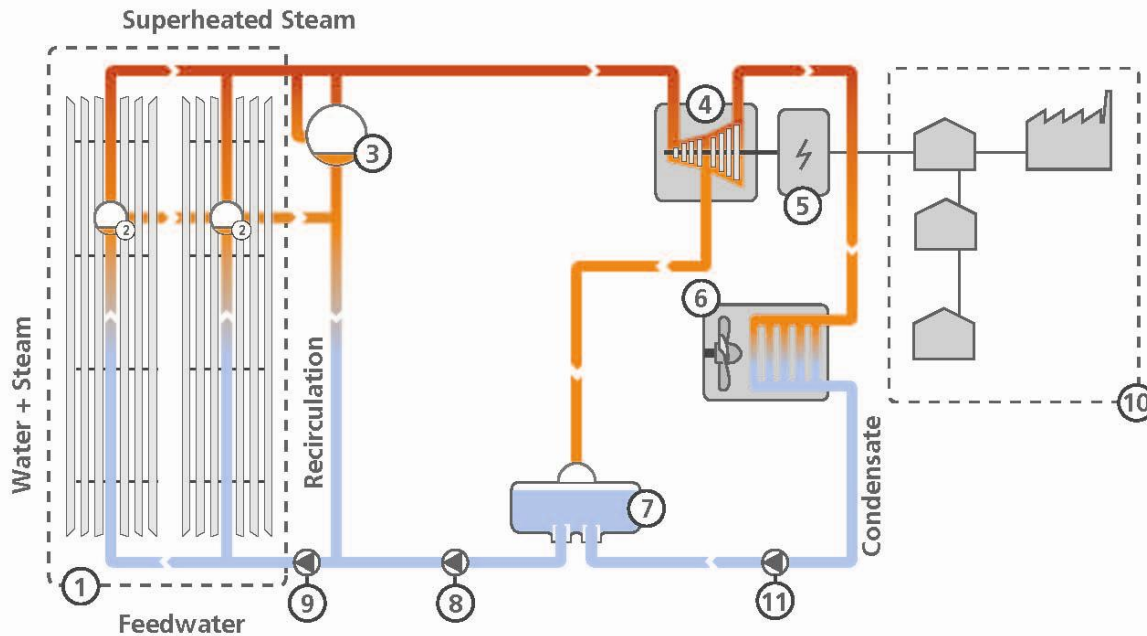


Concentrated Solar Power

ABB integrates Solar Boiler from Novatec Solar

Solar Boiler
by Novatec Solar

Turn Key Power Plant
by ABB



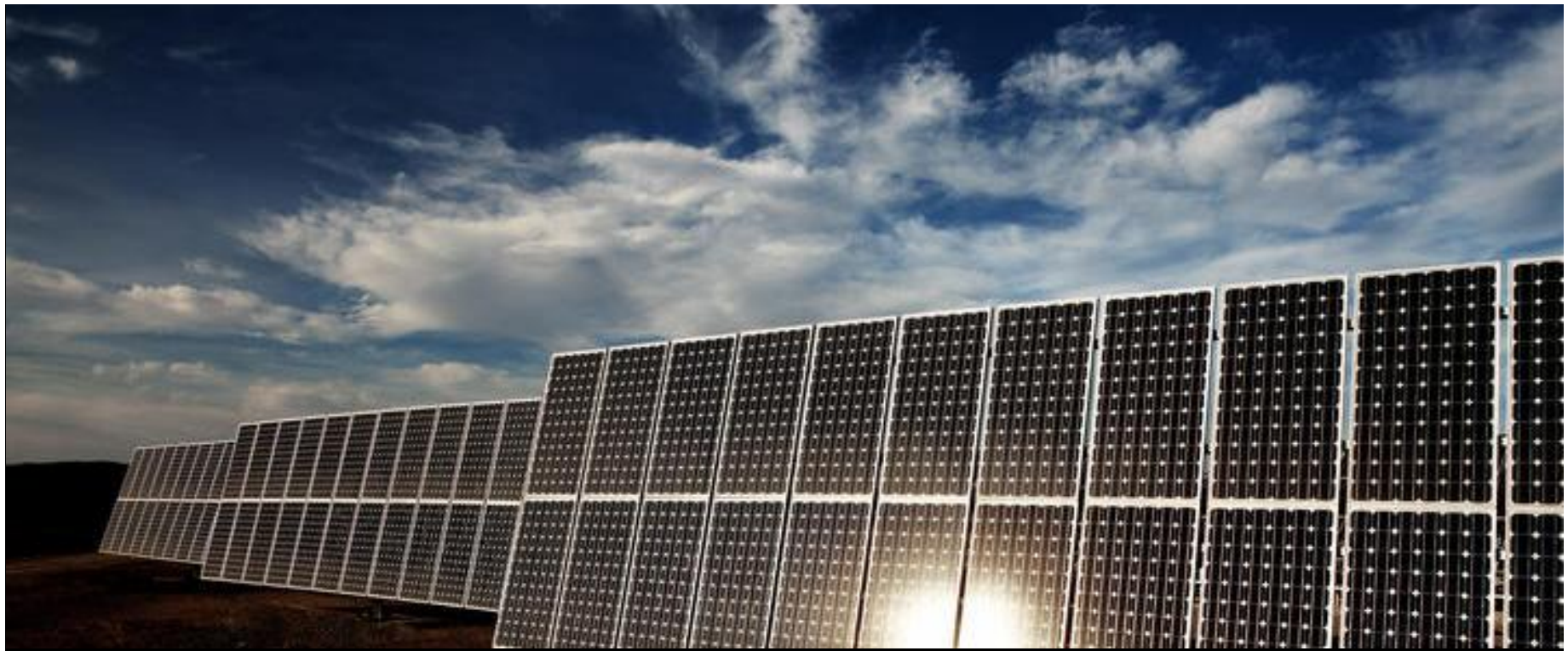
- 1. Solar Field
- 2. Steam Separator
- 3. Volume Balance Tank
- 4. Turbine

- 5. Generator
- 6. Air-Cooled Condenser
- 7. Deaerator/Feedwater Tank
- 8. Feedwater Pump

- 9. Recirculation Pump
- 10. Public Electricity Grid
- 11. Condensate Pump

ABB offers Turn Key solutions for all kind of CSP applications with Novatec Solar as the nominated subcontractor for the Solar Field.

ABB is a relevant strategic minority shareholder of Novatec Solar.



Photovoltaic Power Integrated Solution

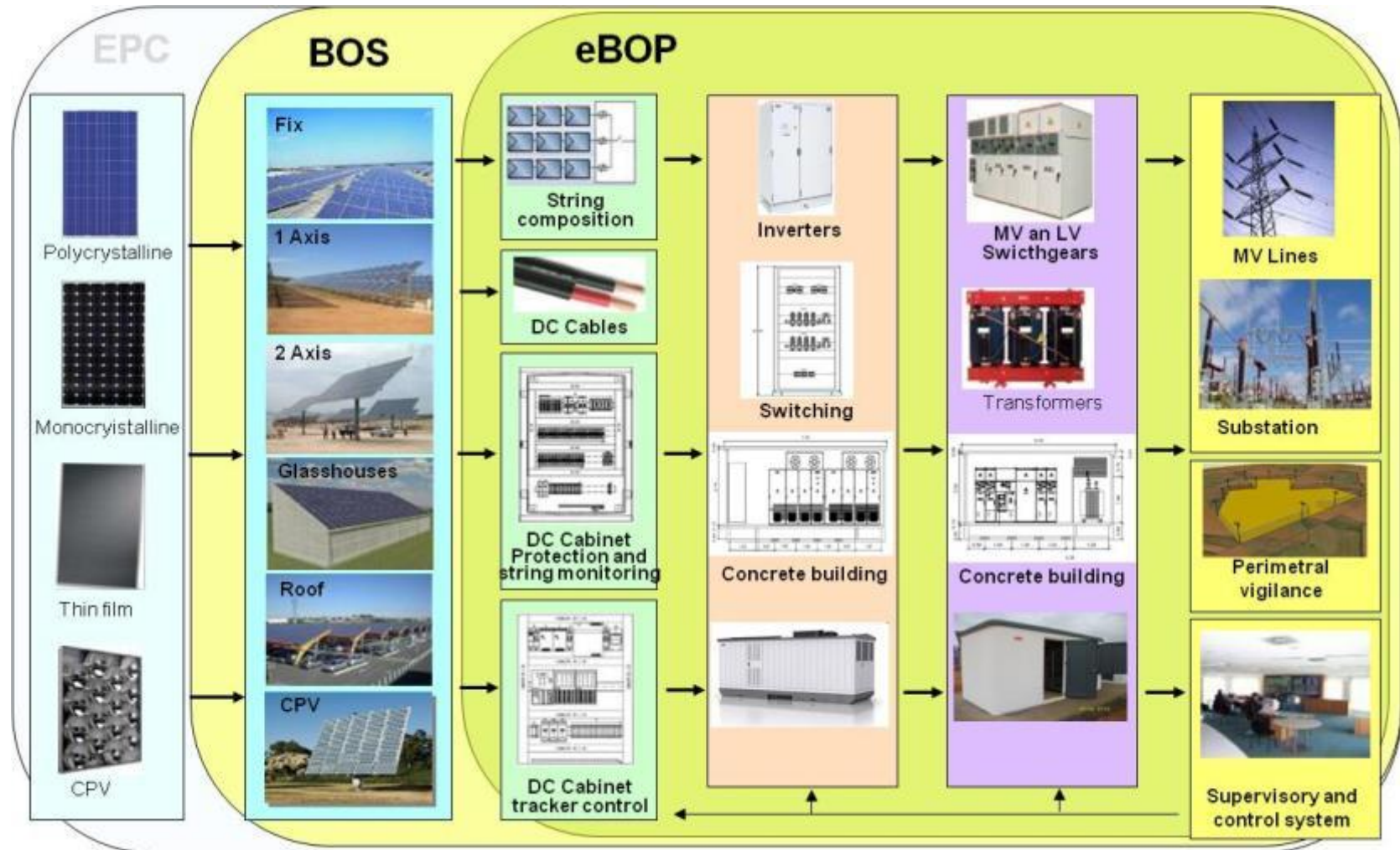
PV Power Plants

ABB delivers Turn Key Plant or Balance of System



PV Power Plants

Clients Requirement defines ABB's scope



Panels

Trackers

DC
Cabling
Protectors

Inverters

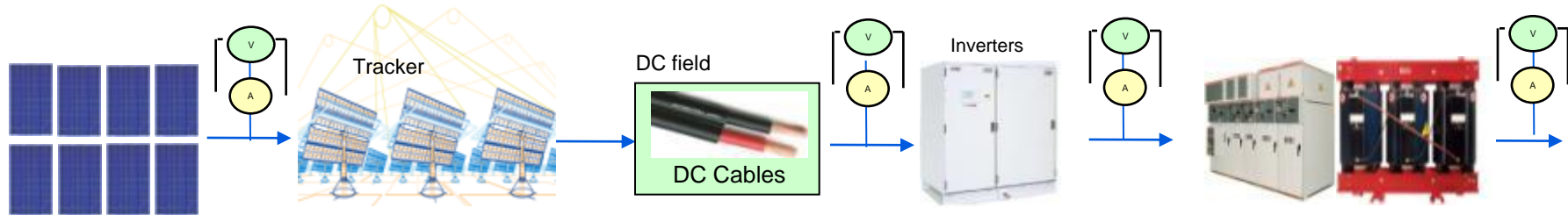
Transformat
ion
Center

Grid
Connection

ABB

PV Power Plants

Integrated Solution for High Performance



Panels

Trackers

DC Cabling
Protectors

Inverters

Transformation
Center

Automation, Monitoring
and Remote Control

Integrated Plant Design,
and Yield Calculation

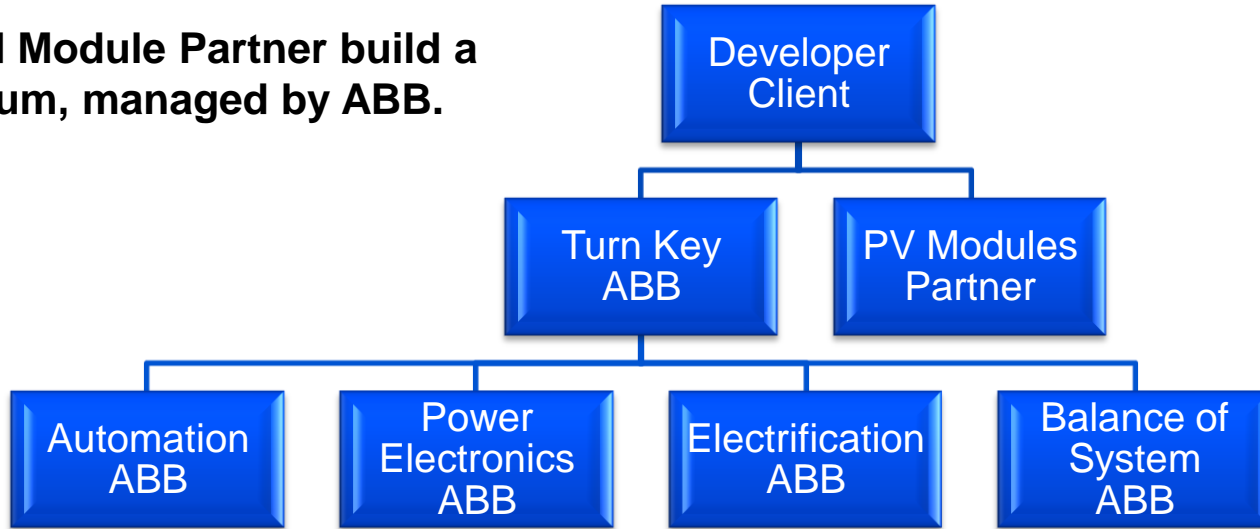
Turn Key Solution
Project Management, Site Management, H&S, Quality Control

External Partner

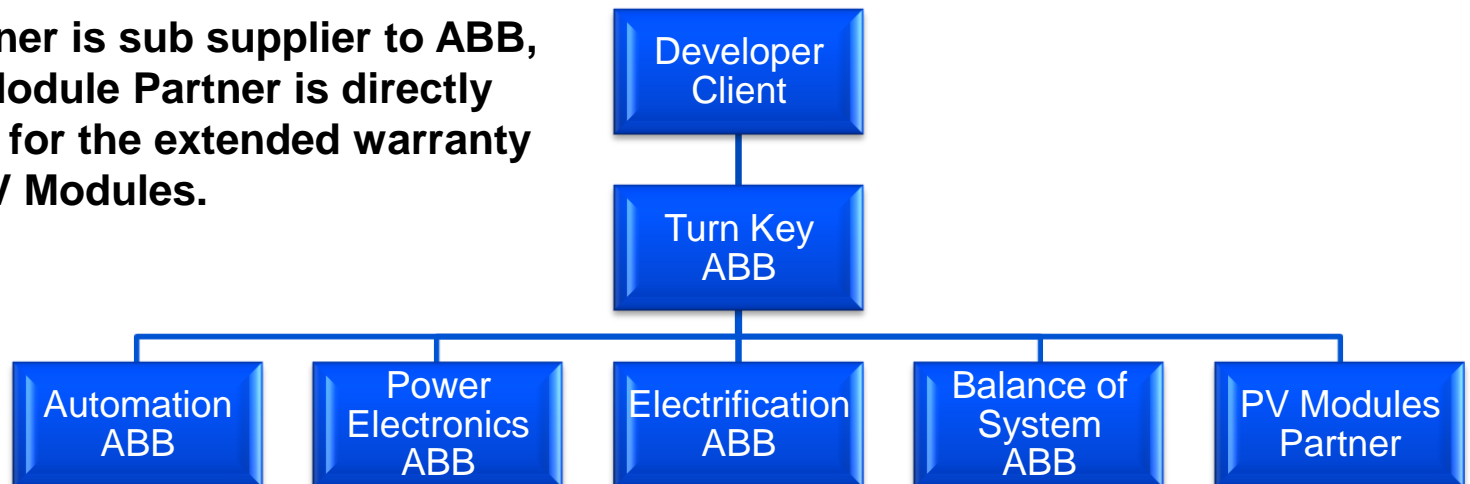
PV Power Plants

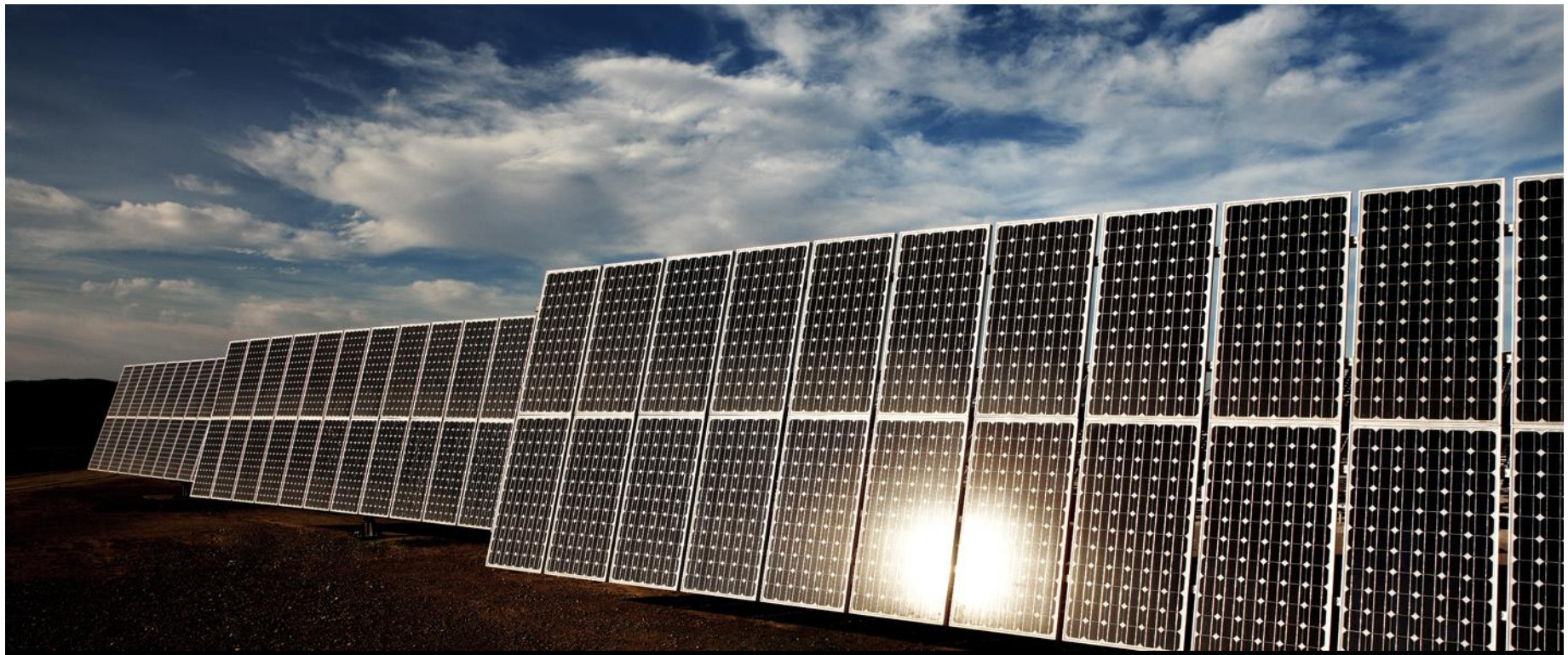
ABB cooperates with Module Supplier

- a) **ABB and Module Partner build a consortium, managed by ABB.**



- b) **Module Partner is sub supplier to ABB, but the PV Module Partner is directly accountable for the extended warranty period of PV Modules.**





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Solar Power Plants at ABB References

CSP Reference

Puerto Errado 1, Spain

Key Data	
EPC Contractor	Novatec Solar
Owner	Novatec Solar
Layout	3 rows of linear Fresnel collectors, conventional steam turbine equipment and generator, storage
Solar field length	806.40 m
Net aperture area	21,571.2 m ²
Operating temperature	Up to 500 °C
Operating pressure	Up to 65 bar
Peak thermal output	12 MW _{th}
Peak electrical output	1.4 MW _{el}
Electrical production	2.2 GWh p.a.



CSP Reference

Puerto Errado 2, Spain

Key data

EPC Contractor	Novatec Solar
Owners	Tubo Sol PE2 S.L. owned by 5 Swiss utilities (85%) and Novatec Solar (15%)
Layout	28 rows of linear Fresnel collectors, conventional steam turbine equipment and generator, storage
Solar field length	940.8 m
Net aperture area	302,000 m ²
Operating temperature	Up to 270 °C
Operating pressure	Up to 55 bar
Peak thermal output	150 MW _{th}
Peak electrical output	30 MW _{el}
Electrical production	49 GWh/year



CSP Reference

Liddell, Australia

Key data

EPC Contractor	Novatec Solar
Owner	Macquarie Generation
Model	4 rows of linear Fresnel collectors, solar augmentation of a coal fired power station
Solar field length	403,2 m
Net aperture area	18,489.60 m ²
Operating temperature	Up to 270°C
Operating pressure	Up to 55 bar
Peak thermal output	9.3 MW _{th}
Thermal Output per year	13,550 MWh _{th}



PV Reference

La Robla, Spain



Customer:
GA Solar

Type of Project: ERCAM 1 axis
Tracker

Turnkey 13,3 MW PV solar plant.

Year of Commissioning:
2010

Customer need

- Maximize the performance and reliability of the solar plant
- Get the plant in operation in 3months

ABB response

- ABB delivers the complete solar plant in consortium with a solar manufacturer
- ABB applied an efficiency improvement system to maximize the overall performance of the PV solar plant
- ABB scope:
 - Supply: Substation, DC cabinets, AC cabinets, unit transformers, switchgears, equipment housing, system optimization, control and SCADA.
 - Turn key installation, ground & civil works: Inverters, trackers, PV modules, transformers and switchgears, cabinets, housing, system optimization, control, SCADA, security system, cabling, etc
- Partner scope: PV modules.

Customer benefit

- Reliable and efficient PV solar plant. Performance Ratio (PR) > 80%
- Optimized operation, control and maintenance of PV solar plant (sun tracking, system optimization, control and protection, etc.)
- La Robla produces 22.6 GWh per year – displaces 11,500 tons of greenhouse gas emissions annually
- Client kept the deadline and qualified for Spanish feed-in tariff for solar plant

PV Reference

La Sugarella, Italy



Size: 24.2 MWp, 1 axis tracker

Customer: Phenix Renewable

ABB Scope: EPC

Year of commissioning:

▪ EPC:2010

Customer needs

- First class automation and electrical systems
- Maximize plant performance and reliability

ABB response

- ABB delivers the complete solar plant in consortium with a solar manufacturer
- ABB applied an efficiency improvement system to maximize the overall performance of the PV solar plant
- ABB scope:
 - Supply: Substation, DC cabinets, AC cabinets, unit transformers, switchgears, equipment housing, system optimization, control and SCADA.
 - Turn key installation, ground & civil works: Inverters, trackers, PV modules, transformers and switchgears, cabinets, housing, system optimization, control, SCADA, security system, cabling, etc

PV Reference

Spinasantà, Italy



Size: 6 MWp, fix installation

Customer: Actelios Solar

ABB Scope: EPC

Year of commissioning:

- EPC: 2010

- Status: Connected to the grid

Customer needs

- First class automation and electrical systems
- Maximize plant performance and reliability

ABB response

- ABB delivers a complete EPC.
- ABB applies an efficiency improvement system to maximize the overall performance of the PV solar plant
- ABB scope:
 - Supply: Panels, structure, inverter centers, DC & AC cabinets, transformers, switchgears, cabling, equipment housing, protection equipment, MV connection line
 - Installation: Panels, structure, inverter centers, DC & AC cabinets, transformers, switchgears, cabling, equipment housing, protection equipment, MV connection line, PV modules electrical connection

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